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# PATENT ABSTRACTS OF JAPAN

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(21) Application number : 10-126980 (71) Applicant : NICHIEI KAKO KK

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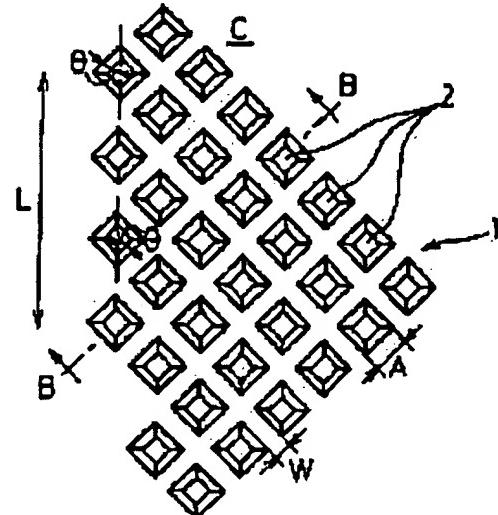
## (54) RELEASE PAPER AND PRESSURE SENSITIVE ADHESIVE SHEET AND PROCESSING OF RELEASING SURFACE

### (57) Abstract:

**PROBLEM TO BE SOLVED:** To obtain a fine pressure sensitive adhesive sheet easy in manufacturing by making a release paper having many inverted quadrangular pyramid like fine recessed parts slantingly located on the releasing surface of the belt like base paper.

**SOLUTION:** The release paper 1 is obtained by embossing the belt like base paper having releasing processed surface C by an embossing roll having many quadrangular pyramid like fine projecting parts on the surface to form many inverted quadrangular pyramid like fine recessed parts 2 arranged slantingly to the longitudinal direction L of the base paper in tilt angle  $\theta$  of  $30^\circ \leq \theta \leq 60^\circ$  and setting the releasing

surface to have the quadrangular pyramid like fine recessed parts having length A of one side of the bottom of  $0.1 \text{ mm} \leq A \leq 2 \text{ mm}$ , the depth H of the recessed part 2 of  $0.003 \text{ mm} \leq H \leq 0.1 \text{ mm}$  and the space W between adjacent fine recessed parts 2 of  $0.02 \leq W \leq 2 \text{ mm}$ . The pressure sensitive adhesive sheet is obtained by applying the pressure sensitive adhesive on the releasing processed face C of the releasing paper 1, filling the adhesive in the fine recessed part 2 and then tightly laminating the surface sheet body.



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**RELEASE SHEET AND PRESSURE-SENSITIVE ADHESIVE SHEET AND  
RELEASE-TREATED SURFACE FABRICATION METHOD**

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Translation Requested by: Scott A. Van Wert 230-1F-03

Translation Provided by: Yoko and Bob Jasper  
Japanese Language Services  
16 Oakridge Drive  
White Bear Lake, MN 55110

(651) 426-3017 Fax (651) 426-8483  
e-mail: [bjasper@mediaone.net](mailto:bjasper@mediaone.net)

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RELEASE SHEET AND PRESSURE-SENSITIVE ADHESIVE SHEET AND RELEASE-TREATED SURFACE FABRICATION METHOD

[*Hakurishi to nen'chaku shihto oyobi hakuri shorimen kakoh houhoh*]

Inventor(s): Tetsuo Oike  
c/o Nichiei Kako Ind., Ltd.  
6-1-33 Wakae  
Higashi-machi, Higashi  
Osaka-shi, Osaka-fu

Applicant(s): 000226091  
Nichiei Kako Ind., Ltd.  
6-1-33 Wakae  
Higashi-machi, Higashi  
Osaka-shi, Osaka-fu

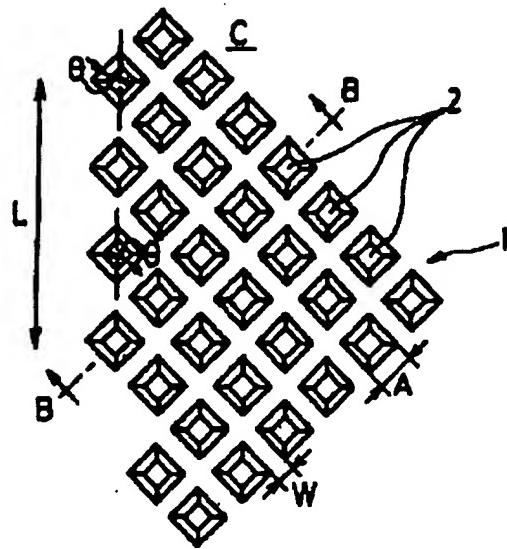
*[There are no amendments to this patent.]*

*[Translator's note: The source document on which this translation is based may have been altered from the original Japanese Patent Application to accommodate machine translation.]*

**(57) [Abstract]**

[Purpose] The purpose of the present invention is to produce a release sheet with an absence of "wrinkles" and "distortion" after formation of recess member, and formation of many release-treated surfaces can be achieved efficiently and a fabrication method for a release-treated surface is provided.

[Means of solution] Multiple independent micro-recessed inverted square frustopyramid members 2.... having square bottoms and four side surfaces with tilt angles  $\theta$  of  $30^\circ$  to  $60^\circ$  on the release-treated surface C are arranged in the longitudinal direction on the strip sheet material having a release-treated surface.

**[Claims of the invention]**

[Claim 1] A release sheet characterized by the fact that many independent inverted square frustopyramid micro-recessed members 2.... are arranged having square bottoms with four sides having a tilt angle  $\theta$  such that  $30^\circ \leq \theta \leq 60^\circ$  with respect to the longitudinal direction L of the material strip sheet 11 having a release-treated surface.

[Claim 2] A pressure-sensitive adhesive sheet consisting of a release sheet where many independent inverted square frustopyramid micro-recessed members 2 ... having a square bottom and consisting of four sides with a tilt angle of  $30^\circ \leq \theta \leq 60^\circ$  to a material strip sheet 11 having a release-treated surface in the longitudinal direction L are arranged on release-treated surface C, pressure-sensitive adhesive layer 14 having many independent micro-projections 19 that fill the above-mentioned micro-recessed members and is laminated to the aforementioned release-treated

surface C and a surface sheet material 15 is further laminated to the above-mentioned pressure-sensitive adhesive layer 14.

[Claim 3] The release sheet or pressure-sensitive adhesive sheet described in Claim 1 or 2 wherein the length of one side A of the above-mentioned bottom surface of the above-mentioned inverted square frustopyramid is set in the range of  $0.1 \text{ mm} \leq A \leq 2 \text{ mm}$ , and the depth H of recessed member 2 is set in the range of  $0.003 \text{ mm} \leq H \leq 0.1 \text{ mm}$ , and the distance W between adjacent recessed members 2, 2 is set in the range of  $0.02 \text{ mm} \leq W \leq 2 \text{ mm}$ .

[Claim 4] The release sheet or pressure-sensitive adhesive sheet described in Claim 1, 2, or 3 wherein the square can be either a quadrilateral or diamond-shaped.

[Claim 5] A fabrication method for a release-treated surface characterized by the fact that an embossing roll having many independent inverted square frustopyramid micro-projection members 7... having a square bottom and consisting of four sides with a tilt angle of  $30^\circ \leq \beta \leq 60^\circ$  on the surface in the direction M to the circumference is press-rolled onto material strip sheet 11 having a release-treated surface, and many independent inverted square frustopyramid micro-recessed members 2 ... are formed that have a square bottom and four side surfaces with a tilt angle of  $30^\circ \leq \theta \leq 60^\circ$  to material strip sheet 11 having a release-treated surface are arranged on the release-treated surface C in the longitudinal direction L.

**[Detailed description of the invention]**

**[0001]**

[Technical field of the invention] The present invention pertains to release sheet and pressure-

sensitive adhesive sheet and a method of fabrication for the release-treated surface.

[0002]

[Prior art] In the past, for a release sheet laminated with a pressure-sensitive adhesive sheet proposed by the present inventor and submitted as Japanese Registered Utility Model No. 2503717, a sheet having many recessed members was used. Namely, when the shape of the micro-recessed members is an inverted square frustum pyramid, the squares at the bottoms of the square frustum pyramids are arranged perpendicular to and parallel to the longitudinal direction (fiber orientation direction) of the release sheet, and small, square frustum pyramidal projections are formed on the surface of the pressure-sensitive adhesive layer as shown in Fig. 3 of the above-mentioned publication.

[0003]

[Problems to be solved by the invention] However, when an attempt is made to form many small recessed inverted square frustum pyramid members with an embossing roll in the production of the above-mentioned release sheet, formation of "wrinkles" in the material is likely to occur at the time of take-up of the sheet when the material for the release sheet supplied from the feed roll passes through the embossing rolls and take-up is provided, unless the tension is increased at the time of feeding and take-up. However, in order to increase the feed tension, a high force for winding of the material is required, and when said force is increased, weaving occurs.

[0004] Furthermore, the release sheet is distorted after formation of the recessed member and waviness is likely to result. Furthermore, in some cases, adhesion is not possible at the time of lamination of the pressure-sensitive adhesive layer. Even when adhesion is possible, warping of the pressure-sensitive adhesive sheet occurs and printing on the surface of the sheet is not

possible, at times. On the other hand, when a plastic film is used for the material, it is not possible to produce a recessed member with a specific depth unless the speed of the operation is reduced.

[0005] Based on the above background, the purpose of the present invention is to eliminate the above-mentioned existing problems and to form a recessed member with a clean shape, efficiently without producing "wrinkles" and "distortion" after forming the recessed members, and to produce a release sheet (film) having excellent properties when made into a pressure-sensitive adhesive sheet and to produce a (fabricated) pressure-sensitive adhesive sheet. Furthermore, the invention is to provide a method for manufacturing (method for fabrication of the release-treated surface).

[0006]

[Means to solve the problem] In order to achieve the above-mentioned purpose, the release sheet of the present invention has many independent inverted square frustopyramid micro-recessed members 2.... are arranged having square bottoms with four sides having a tilt angle  $\theta$  such that  $30^\circ \leq \theta \leq 60^\circ$  with respect to the longitudinal direction L of the material strip sheet 11 having a release-treated surface.

[0007] Furthermore, the (fabricated) pressure-sensitive adhesive sheet has the structure of a release sheet where many independent inverted square frustopyramid micro-recessed members 2.... are arranged having square bottoms with four sides having a tilt angle  $\theta$  such that  $30^\circ \leq \theta \leq 60^\circ$  with respect to the longitudinal direction L of the material strip sheet 11 having a release-treated surface on the release-treated surface C, a pressure-sensitive adhesive layer 14 having many independent micro-projections 19 that fill the above-mentioned micro-recessed

members and laminated onto the aforementioned release-treated surface C and a surface sheet material 15 further laminated onto the above-mentioned pressure-sensitive adhesive layer 14.

[0008] Furthermore, the length of one side of the above-mentioned bottom surface of the above-mentioned inverted square frustopyramid is set in the range of  $0.1 \text{ mm} \leq A \leq 2 \text{ mm}$ , and the depth of recessed member 2 is set in the range of  $0.003 \text{ mm} \leq H \leq 0.1 \text{ mm}$ , and the distance W between the adjacent recessed members 2, 2 is set in the range of  $0.02 \text{ mm} \leq W \leq 2 \text{ mm}$ . Furthermore, it is desirable when the above-mentioned square is either quadrilateral or diamond.

[0009] And furthermore, in a fabrication method for a release-treated surface, embossing roll having many independent inverted square frustopyramid micro-projection members having a square bottom and consisting of four sides with a tilt angle of  $30^\circ \leq \beta \leq 60^\circ$  on the surface in the circumference direction M are roll-pressed onto a material strip sheet having a release-treated surface, and many independent inverted square frustopyramid micro-recess members having a square bottom and consisting of four sides with a tilt angle of  $30^\circ \leq \theta \leq 60^\circ$  are formed on a strip sheet having a release-treated surface in the longitudinal direction of the release-treated surface.

[0010]

[Embodiment of the invention] In the following, the present invention is explained in further detail with drawings.

[0011] An enlarged view of the material used for the release sheet is shown in Fig. 3. The material sheet 11 is a (long) strip, and in general, the strip is rolled. And as shown in Fig. 3, the strip has a structure consisting of sheet base material 4, resin layer 5, and auxiliary resin layer 6.

[0012] In this case, the material sheet 11 used for the release sheet is paper, plastic, etc., and the thickness T of the base material sheet 4 is preferably in the range of  $25 \mu\text{m}$

$\leq t \leq 250 \mu\text{m}$ . (In other words, the sheet is referred to as a "release sheet" in this case even when the base material sheet 4 is made of plastic.)

[0013] Fig. 1 shows an application example of the release sheet of the present invention, and many independent inverted square frustopyramid micro-recess members 2 ... having a square bottom and four side surfaces with a tilt angle in the range of  $30^\circ \leq \theta \leq 60^\circ$  to material strip sheet 11 having a release-treated surface in the longitudinal direction L are arranged over the entire surface of the release-treated surface C (shown in Fig. 3).

[0014] In specific terms, the above-mentioned release sheet 1 has many independent inverted square frustopyramid micro-recessed members 2 ... on the release-treated surface C, and a laminate 3 having many small projections 17 ... formed in correspondence to the above-mentioned recessed members on the other surface D as shown in Fig. 2. Furthermore, the micro-recessed member 2 may be an inverted square frustopyramid with a diamond shape consisting of four sides with a tilt angle  $\theta$  of  $30^\circ \sim 60^\circ$  to the longitudinal direction L as shown in Fig. 7.

[0015] In specific terms, the above-mentioned laminate 3 is a structure comprising a sheet-like base material 4, resin layer 5 made of a plastic such as polyethylene formed on one surface 4a of the aforementioned sheet-like base material 4 and auxiliary resin layer 6 made of a similar material formed on the other surface 4b. In this case, a release treatment is provided for resin layer 5 (for reference, see Fig. 2 and Fig. 3).

[0016] Furthermore, the other surface D may be a flat surface (without the small projections shown in Fig. 2) as shown in Fig. 8(a). In other words, the auxiliary layer 6 may be a flat surface. The auxiliary layer on the other surface may be omitted as shown in Fig. 8(b).

[0017] Furthermore, in the recessed member 2 ... shown in Fig. 1 and Fig. 2 (or Fig. 7 and Fig.

8), the length A of one side of the bottom surface of the inverted square frustopyramid is set in the range of  $0.1 \text{ mm} \leq A \leq 2 \text{ mm}$ , and the depth H of the recessed member 2 is set in the range of  $0.003 \text{ mm} \leq H \leq 0.1 \text{ mm}$ , and the distance W between the adjacent recessed members 2, 2 is set in the range of  $0.02 \text{ mm} \leq W \leq 2 \text{ mm}$ .

[0018] When the length of one side A of the bottom surface of the inverted square frustopyramid (square-shaped or diamond-shaped) is 0.1 mm or less, releasing of trapped air cannot be achieved at the time of application, and sticking occurs when the length exceeds 2 mm, and release of trapped air cannot be achieved at the time of application cannot be achieved in this case as well.

[0019] Furthermore, when the depth H of the recessed member is 0.003 mm or less, releasing of trapped air cannot be achieved at the time of application; on the other hand, when the depth exceeds 0.1 mm, the amount of pressure-sensitive adhesive required to fill the recessed member is increased and runout of the pressure-sensitive adhesive occurs at the time of cutting of the pressure-sensitive adhesive sheet. Furthermore, when the distance between the adjacent recessed members 2, 2 is 0.02 mm or below, the width of the air removal slot formed is reduced, and removal of air outside the sheet cannot be achieved. On the other hand, when the above-mentioned distance exceeds 2 mm, an adequate adhesive force cannot be achieved.

[0020] In this case, the fiber direction of the material strip sheet runs in the longitudinal direction L. In other words, in the production of a paper or plastic film, the material is arranged in the traveling (longitudinal) direction of the fabrication process; thus, the fiber is oriented in the longitudinal direction. As a result, the strength in the longitudinal direction is significantly greater than the strength in the width direction.

[0021] Thus, application of projection members perpendicular to the above-mentioned fiber

orientation is difficult, but as explained above, each side of micro-recessed member is arranged at an angle of  $30^\circ \leq \theta \leq 60^\circ$  as described above; thus, formation of recessed member can be achieved with a relatively low compression force.

[0022] Furthermore, when a paper material is used for the sheet base material 4 of material strip sheet 11, many different types of paper can be used, and for example, it is desirable to use high-quality paper with a basis of approximately  $50 \text{ g/m}^2$  to  $200 \text{ g/m}^2$ . Subsequently, the surface of the paper is laminated with polyethylene, etc. as described above. The thickness of the above-mentioned laminated film is in the range of  $10 \mu\text{m}$ ~ $30 \mu\text{m}$ .

[0023] Furthermore, a hard plastic such as a polyester film is used for the release film (material strip sheet 11) in many cases, and formation of recessed members can be easily formed under a relatively low compression force according to the method of the present invention. Furthermore, for the plastic material used, polyethylene, polypropylene, polyester, etc. can be mentioned.

[0024] In the following, the release-treated surface fabrication method for the above-mentioned release sheet 1 is explained. Fig. 4 is an overall schematic view of the apparatus used for the release-treated surface fabrication. Fig. 5 is an enlarged perspective view of the essential part of embossing roll 8 used for fabrication. As shown in Fig. 4 and Fig. 5, an embossing roll 8 is produced which is made of iron and has many independent square frustopyramid micro-projections 7 ... with square-shaped or diamond-shaped bottom surfaces consisting of four sides at a tilt angle  $\beta$  of  $30^\circ$  to  $60^\circ$  with the circumference direction M are formed over the entire surface.

[0025] For example, an embossing roll having a diameter of 300 mm is used, and the length of one side of the micro-recessed member 7 at the upper surface is set at 0.30 mm, the length of one

side of the bottom surface is set at 0.50 mm, distance between adjacent projections is set at 0.05 mm, the height is set at 0.065 mm and the tilt angle  $\beta$  is set at 45°.

[0026] Subsequently, paper roll (or rubber roll) 9 corresponding to the above-mentioned embossing roll 8 is arranged, a specific compression force is applied to both ends of the embossing roll having a roll surface length of 1300 mm. Then, a long material strip sheet 11 wound on feed roll 12 (see Fig. 3 for reference) is fed in the direction E shown by the arrow, and the material strip sheet is fed to the embossing roll in the direction shown by arrow J.

[0027] In this case, embossing roll 8 and paper roll 9 rotate in the direction shown by the arrows F and G, respectively, and material strip sheet 11 is passed between rolls 8 and 9, and recessed members 2 ... with  $\theta=45^\circ$  corresponding to the above-mentioned projection members 7 ... are formed over the entire surface of the release-treated surface C (for reference, see Fig. 1 and Fig. 2). Subsequently, release sheet 1 travels in the direction shown by arrow K and take-up is provided by take-up roll 13 in the direction shown by arrow P.

[0028] For example, when a high-quality paper with a basis of 110 g/m<sup>2</sup> is used for the sheet base material 4 of material strip sheet shown in Fig. 3, recessed member 2 ... having a depth H of 0.04 mm was formed without "wrinkles" when the feed tension and take-up tension of 30 kg and 50 kg, respectively, are used. Furthermore, when formation of recessed members 2 ... is carried out for a plastic film having a thickness T of 0.038 mm under the same conditions, recessed member 2 ... having a depth H of 0.020 mm are produced.

[0029] As shown in Fig. 6(a), a pressure-sensitive adhesive is coated on the release-treated surface C of the above-mentioned release sheet 1, and a portion fills the micro-recessed members 2 ... of the release sheet. In other words, micro-projection members 19 are formed.

Subsequently, drying is provided for the above-mentioned pressure-sensitive adhesive to produce a pressure-sensitive adhesive layer 14. Subsequently, one side of the surface sheet material 15 is applied to the pressure-sensitive adhesive layer 14 on the side opposite release sheet 1, and the pressure-sensitive adhesive layer and release sheet are mutually bonded to form pressure-sensitive adhesive sheet main unit 16.

[0030] The design of the present invention is not limited to the above-mentioned example. For example, the length of one side of the bottom surface A, depth H, and distance between the adjacent recessed members 2,2 of the micro-recessed member 2 ... may be changed within the range of  $0.1 \text{ mm} \leq A \leq 2 \text{ mm}$ ,  $0.003 \text{ mm} \leq H \leq 0.1 \text{ mm}$ , and  $0.02 \text{ mm} \leq W \leq 2 \text{ mm}$ , respectively. Furthermore, in addition to the shapes shown in Fig. 7, a diamond shape or other quadrilateral can be used as well.

[0031]

[Effect of the invention] The present invention having the above-mentioned structure offers the advantages described below.

[0032] (According to Claim 1 or 2), recessed member 2 ... is formed with the sides in a the direction different from perpendicular to the longitudinal direction of the release sheet 1, recessed member 2 ... can be formed on the release-treated surface C with a lower compressive force and tension. And furthermore, a clean release sheet with an absence of "distortion" and "wrinkles" in the surface can be produced, and a clean pressure-sensitive adhesive sheet main unit 16 can be easily fabricated.

[0033] When adhesive fabrication is carried out for a conventional release sheet where the sides of the square frustum pyramid at right angles and parallel to the longitudinal direction, when the

valley members (recessed member) are filled, the right angle direction is filled rapidly and uniform filling cannot be achieved. This poses a problem at the time of release of the gas generated upon bonding with the plastic, but with the present invention, the fill rate is uniform and no problems are posed.

[0034] (According to Claim 3 or Claim 4), an accurate recessed member 2 ... can be easily produced. Furthermore, entrapment of air between the pressure-sensitive adhesive layer 14 and another object does not occur and thus "blistering" is absent. Furthermore, the gas generated between the pressure-sensitive adhesive layer and other object can be naturally removed and formation of "blisters" is absent.

[0035] (According to Claim 5), projection member 7 ... is formed on the surface of embossing roll 8 with tilt angle  $\beta$  in the circumference direction M, thus, compression of projection member 7 ... can be achieved on the release sheet in a direction away from the fiber direction. Thus, the projection member is likely form an indentation and formation of recessed member 2 ... can be accurately achieved without "distortion" and "wrinkles". Furthermore, the above-mentioned fabrication can be efficiently achieved.

[0036] Furthermore, the depth of the recessed member (valley member) formed between micro-recessed members 19 ... on the surface of the pressure-sensitive adhesive layer is uniform in all directions, and release of gas generated after application can be easily achieved. In other words, the directional property of the recessed member (valley member) is eliminated (as adhesive sheet 16), and release of the gas generated can be achieved in all directions, and "blistering" can be prevented.

**[Brief description of the figures]**

- [Fig. 1] Enlarged top view that shows the essential parts of an application example of the present invention.
- [Fig. 2] Enlarged side cross-section view at B-B in Fig. 1.
- [Fig. 3] Enlarged side cross-section view that shows the condition before fabrication.
- [Fig. 4] Schematic explanatory drawing that shows the fabrication method.
- [Fig. 5] Perspective view of enlargement of essential parts.
- [Fig. 6] Enlarged side cross-section view that shows many different forms of the pressure-sensitive adhesive sheet.
- [Fig. 7] Enlarged top view that shows modified version of Fig. 1.
- [Fig. 8] Enlarged cross-section view that shows modified version of Fig. 2.

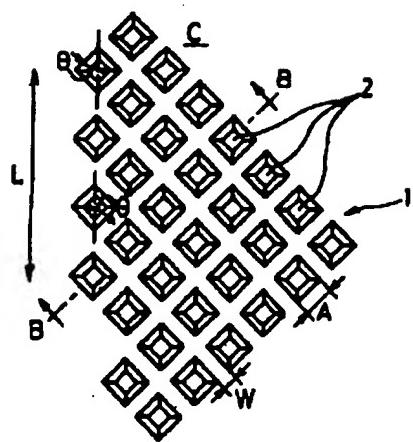
**[Explanation of codes]**

- 2 Micro-recessed member
- 7 Micro-projection member
- 8 Embossing roll
- 11 Material strip sheet
- 14 Pressure-sensitive adhesive layer
- 15 Surface sheet
- 16 Pressure-sensitive adhesive sheet
- 19 Micro-projection member
- A Length dimension

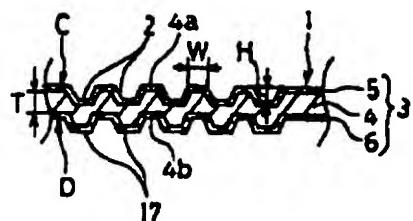
- C Release-treated surface
- H Depth dimension
- L Longitudinal direction
- M Circumference direction
- W Interval dimension
- $\theta$  Tilt angle
- $\beta$  Tilt angle

【図 1】

[Figure 1]

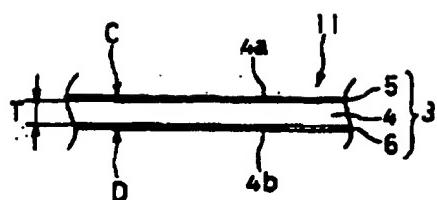


【図2】



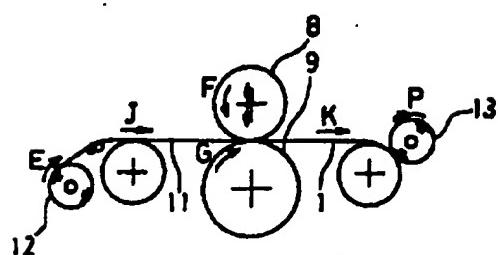
[Figure 2]

【図3】



[Figure 3]

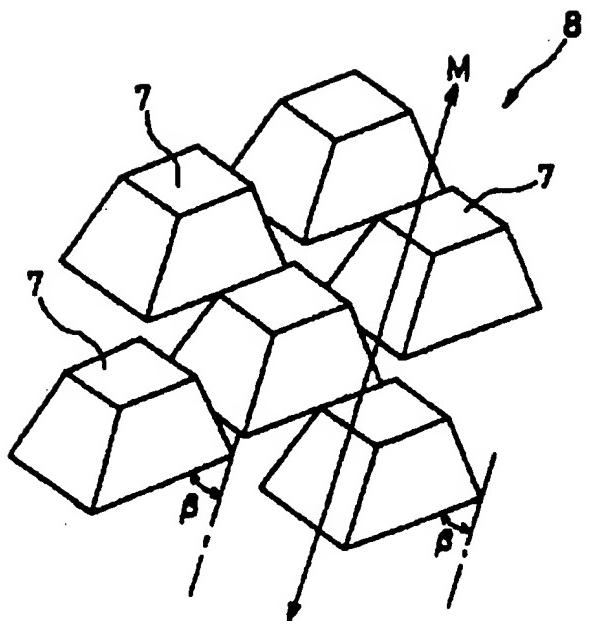
【図4】



[Figure 4]

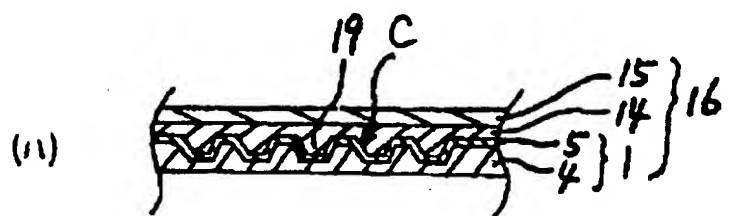
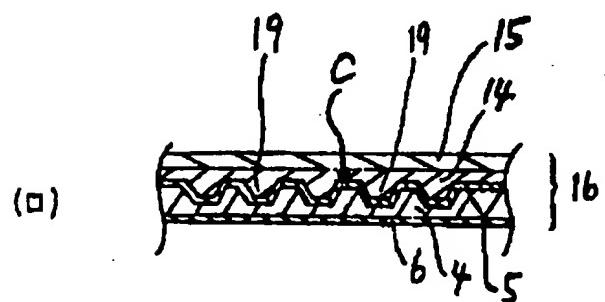
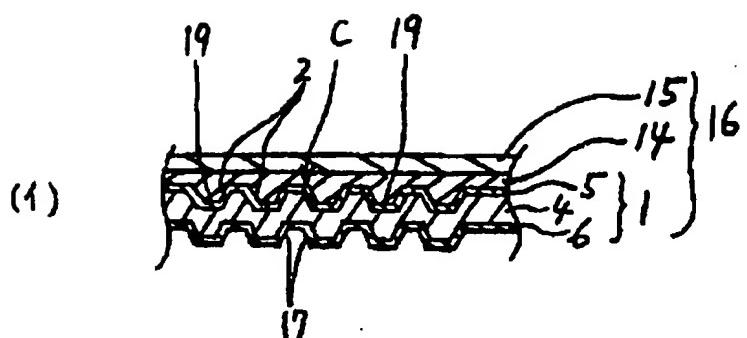
【図5】

[Figure 5]



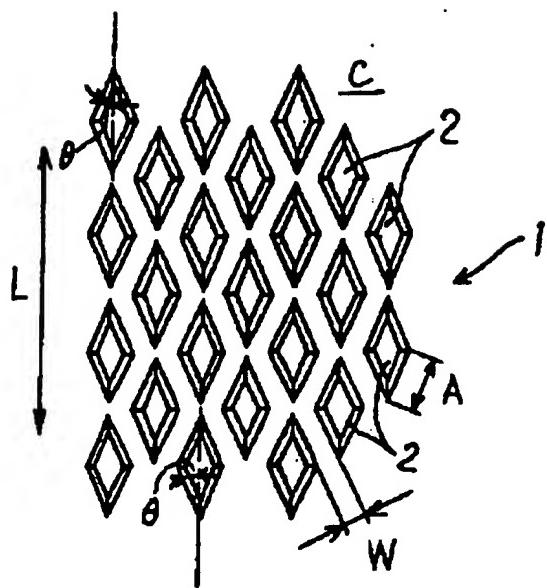
【図 6】

[Figure 6]



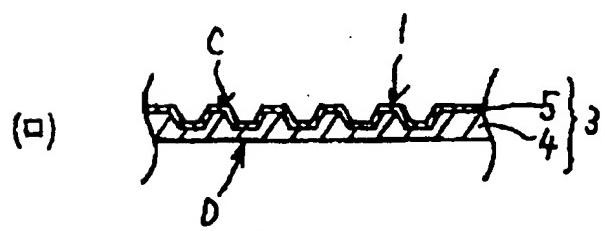
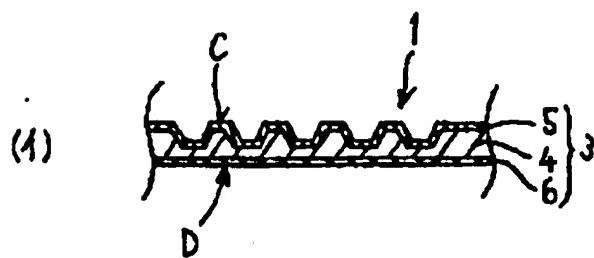
【図 7】

[Figure 7]



【図 8】

[Figure 8]



012957371 \*\*Image available\*\*

WPI Acc No: 00-129221/200012

Releasing paper for adhesion sheet - consists of strip-shaped material having a longitudinal directional surface containing specific micro recess, on which the peeling process is performed

Patent Assignee: NICHEI KAKO KK (NICH-N)

Number of Countries: 001 Number of Patents: 001

Patent Family:

Patent No	Kind	Date	Applicat No	Kind	Date	Main IPC	Week
JP 11323790	A	19991126	JP 98126980	A	19980511	D21H-027/00	200012 B

Priority Applications (No Type Date): JP 98126980 A 19980511

Patent Details:

Patent	Kind	Lan	Pg	Filing Notes	Application	Patent
JP 11323790	A		6			

Abstract (Basic): JP 11323790 A

NOVELTY - The releasing paper consists of a strip shaped material having a longitudinal directional surface (L), on which the peeling process is performed. The surface (L) contains micro recess in the shape of inverted tetragon. The inclination angle theta of the micro recess with the peeling process surface (C), is 30 - 60 deg. .

DETAILED DESCRIPTION - INDEPENDENT CLAIMS. are included for the following: (i) Adhesion sheet (16) - an adhesion layer (14) laminated on the peeling process surface, contains microconvex part (19). The adhesion layer is also provided in the micro recess. A surface sheet material (15) is laminated on the adhesion layer. (ii) Peeling process surface processing method - the strip shaped paper containing the micro convex part is pressed along its peripheral direction, using an embossing roll.

USE - Used for adhesion sheet.

ADVANTAGE - Peeling process is performed efficiently at high speed. Polarity of the trough is eliminated.

DESCRIPTION OF DRAWING - The figure shows the enlarged plan view and expanded sectional view of the releasing paper. (2) Micro recess; (14) Adhesion layer; (15) Surface sheet material; (16) Adhesion sheet; (19) Micro convex part; (C) Peeling process surface; (L) Longitudinal directional surface.

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(71)出願人 000226091

日榮化工株式会社

大阪府東大阪市若江東町6丁目1番33号

(72)発明者 大池 哲夫

東大阪市若江東町6丁目1番33号 日榮化  
工株式会社内

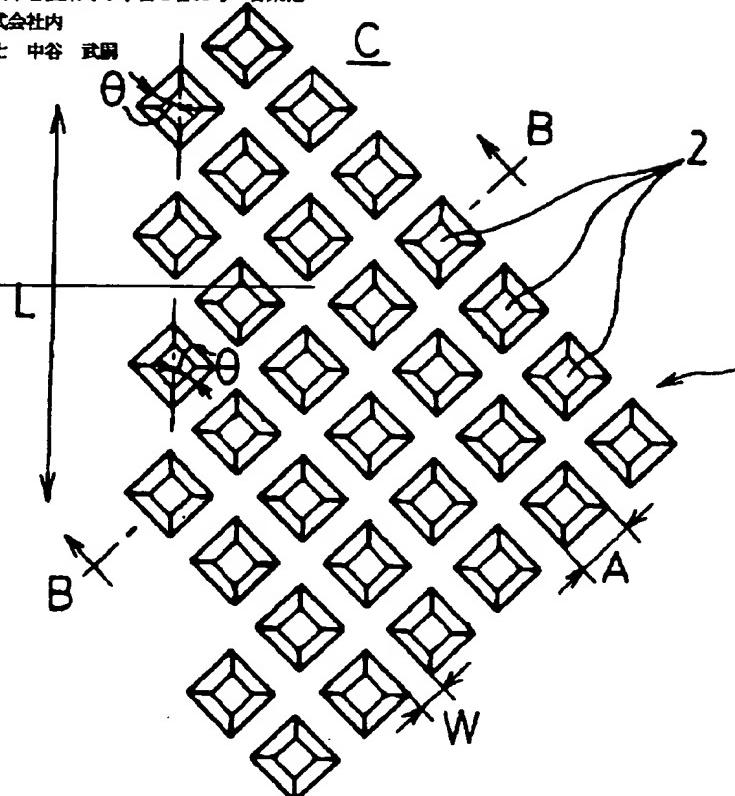
(74)代理人 弁理士 中谷 武嗣

(54)【発明の名称】 別離紙と粘着シート及び別離処理面加工方法

(57)【要約】

【課題】 四部形成後に「しわ」や「歪み」を生じることなく、能率よく多数の四部が形成でき、かつ、粘着加工が容易な別離紙及び別離処理面加工方法の提供にある。

【解決方法】 表面が別離処理された帯状素材紙の長手方向に対して $30^\circ \sim 60^\circ$  の傾斜角度θをもつて傾いた四辺により形成される四角形を底面とする独立した多数の倒立四角錐台状の微小四部2…を別離処理面Cに配置している。



## 【特許請求の範囲】

【請求項1】 表面が剥離処理された帯状素材紙11の長手方向Iに対して $30^\circ \leq \theta \leq 60^\circ$  の傾斜角度 $\theta$ をもって傾いた四辺により形成される四角形を底面とする独立した多数の倒立四角錐台状の微小凹部2…を剥離処理面に配置したことを特徴とする剥離紙。

【請求項2】 表面が剥離処理された帯状素材紙11の長手方向Iに対して $30^\circ \leq \theta \leq 60^\circ$  の傾斜角度 $\theta$ をもって傾いた四辺により形成される四角形を底面とする独立した多数の倒立四角錐台状の微小凹部2…を剥離処理面Cに配置した剥離紙と、この剥離処理面Cに積層されて上記微小凹部2…内にまで充填された独立した多数の微小凹部19を有する粘着層14と、この粘着層14に積層された表面シート体15と、から構成されたことを特徴とする粘着シート。

【請求項3】 上記倒立四角錐台の上記底面の一辺の長さ寸法Aを $0.1\text{ mm} \leq A \leq 2\text{ mm}$ の範囲に設定し、かつ、凹部2の深さ寸法IIを $0.003\text{ mm} \leq II \leq 0.1\text{ mm}$ の範囲に設定し、さらに、隣り合う該凹部2、2の間隔寸法Wを $0.02\text{ mm} \leq W \leq 2\text{ mm}$ の範囲に設定した請求項1又は2記載の剥離紙又は粘着シート。

【請求項4】 四角形が正方形乃至菱形である請求項1、2又は3記載の剥離紙又は粘着シート。

【請求項5】 周方向Mに対して $30^\circ \leq \beta \leq 60^\circ$  の傾斜角度 $\beta$ をもって傾いた四辺により形成される四角形を底面とする独立した多数の四角錐台状の微小凸部7…を表面に有するエンボスロール8を、表面が剥離処理された帯状素材紙11に対して転動押圧し、かつ、該帯状素材紙11の長手方向Iに対して $30^\circ \leq \theta \leq 60^\circ$  の傾斜角度 $\theta$ をもって傾いた四辺により形成される四角形を底面とする独立した多数の倒立四角錐台状の微小凹部2…を上記剥離処理面Cに形成することを特徴とする剥離処理面加工方法。

## 【発明の詳細な説明】

## 【0001】

【発明の属する技術分野】本発明は、剥離紙と粘着シート及び剥離処理面加工方法に関する。

## 【0002】

【従来の技術】従来、本発明者が既に提案した実用新案登録公報第2503717号に記載の粘着加工シートに重ねて使用される剥離紙は、次のような多数の凹部を有するものが用いられてきた。即ち、凹部が、倒立四角錐台状の場合に、その四角錐台の底面の正方形の各辺は、剥離紙の長手方向(繊維の配置される方向)に対して、直角・平行に向くように配置され、上記公報の図3のような四角錐台状の小凹部が、粘着層表面に形成されていた。

## 【0003】

【発明が解決しようとする課題】しかしながら、上記のような剥離紙を製造する際に、多数の小さな倒立四角錐台状の凹部をエンボスロールを用いて形成しようとする

と、剥離紙用の帯状素材紙を練出ロールから練出して、エンボスロールを通して、その後巻取りロールにて巻取る時に練出し及び巻取り張力を大きくしないと、素材に「しわ」が発生する虞れがあった。しかしながら、練出し張力を大きくするためには、材料の巻強さを大きくしなければならないが、巻強さを大きくすると、巻取りが起っていた。

【0004】また、剥離紙に於て、凹部形成後に歪みが生じて、波打ちを起こす虞れがあった。そして、極端な場合には粘着層を積層する粘着加工ができなかった。しかも、粘着加工ができた場合でも、粘着加工シートに反りが生じて、表面への印刷等が困難となることがあった。一方、材質がプラスチックフィルムの場合には、練業速度を小さくしなければ所定の深さの凹部を形成することができなかつた。

【0005】そこで、本発明は、上述の問題を解決して、凹部形成後に「しわ」や「歪み」を生じることがなく能率よく良形の凹部が形成でき、かつ、粘着加工されたシートの粘着特性に於ても有利さが得られる剥離紙

(フィルム)と、それによる粘着(加工)シートを、提供することを目的とする。さらに、その製造方法(剥離処理面加工方法)を提供することを目的とする。

## 【0006】

【課題を解決するための手段】上記目的を達成するためには、本発明に係る剥離紙は、表面が剥離処理された帯状素材紙の長手方向に対して $30^\circ \sim 60^\circ$  の傾斜角度をもって傾いた四辺により形成される四角形を底面とする独立した多数の倒立四角錐台状の微小凹部を剥離処理面に配置している。

【0007】また、本発明に係る粘着(加工)シートは、表面が剥離処理された帯状素材紙の長手方向に対して $30^\circ \sim 60^\circ$  の傾斜角度をもって傾いた四辺により形成される四角形を底面とする独立した多数の倒立四角錐台状の微小凹部を剥離処理面に配置した剥離紙と、この剥離処理面に積層されて上記微小凹部内にまで充填された独立した多数の微小凹部を有する粘着層と、この粘着層に積層された表面シート体と、から構成されている。

【0008】また、上記倒立四角錐台の上記底面の一辺の長さ寸法を $0.1\text{ mm} \sim 2\text{ mm}$ の範囲に設定し、かつ、凹部の深さ寸法を $0.003\text{ mm} \sim 0.1\text{ mm}$ の範囲に設定し、さらに、隣り合う該凹部の間隔寸法を $0.02\text{ mm} \sim 2\text{ mm}$ の範囲に設定している。なお、好ましくは、上記四角形を、正方形乃至菱形とする。

【0009】また、本発明に係る剥離処理面加工方法は、周方向に対して $30^\circ \sim 60^\circ$  の傾斜角度をもって傾いた四辺により形成される四角形を底面とする独立した多数の四角錐台状の微小凹部を表面に有するエンボスロールを、表面が剥離処理された帯状素材紙に対して転動押圧し、かつ、該帯状素材紙の長手方向に対して $30^\circ \sim 60^\circ$  の傾斜角度をもって傾いた四辺により形成される四角

形を底面とする独立した多数の倒立四角錐台状の微小凹部を上記剥離処理面に形成する。

#### 【0010】

【発明の実施の形態】以下、実施の形態を示す図面に基づき、本発明を詳説する。

【0011】図3に、剥離紙の素材を拡大して示し、この素材紙11は、(長尺の)帯状であって、一般的にロール巻きされている。そして、図3に示すように、シート基材4と樹脂層5と補助樹脂層6とから成る。

【0012】なお、この剥離紙用の素材紙11は、シート基材4の材質を、紙又はプラスチックフィルム等としたものであり、シート基材4の厚さ寸法Tは、 $25\mu\text{m} \leq T \leq 250\mu\text{m}$ とするのが好ましい。(即ち、本発明に於て、シート基材4の材質が、プラスチックの場合も、「剥離紙」と呼ぶこととする。)

【0013】図1は、本発明の剥離紙の実施の一形態を示し、この剥離紙1は、(図3に示した)表面が剥離処理された帯状素材紙11の長手方向Lに対して $30^\circ \sim 60^\circ$ の傾斜角度θをもって傾いた四辺により形成される正方形を底面とする独立した多数の倒立四角錐台状の微小凹部2…を、剥離処理面Cの全面に配布している。

【0014】具体的に説明すると、図2に示すように、この剥離紙1は、独立した多数の微小凹部2…を剥離処理面C側に有すると共にこの凹部2…に対応して形成された多数の小突起部17…を他面D側に有する積層体3から成る。なお、図7に示すように微小凹部2の形状としては、長手方向Lに対して $30^\circ \sim 60^\circ$ の傾斜角度θをもって傾いた四辺より成る「菱形」を底面とする倒立四角錐台状に構成するも、自由である。

【0015】さらに詳しく説明すると、この積層体3は、(図2と図3に示したように、)シート状基材4と、このシート状基材4の一辺4aに被覆状に形成されたポリエチレン等のプラスチック製の樹脂層5と、他面4bに被覆状に形成された同様の素材の補助樹脂層6とから構成される。なお、樹脂層5にはその上に剥離処理が施される。

【0016】また、図8(イ)に示す如く、他面D側を(図2の小突起部17…を省略して)平坦面状とするも自由である。つまり、補助樹脂層6が平面状態にある。あるいは、図8(コ)に示す如く、他面D側に補助樹脂層6を省略するも、自由である。

【0017】なお、図1と図2(又は図7と図8)に示した凹部2…に於て、倒立四角錐台の底面の一边の長さ寸法Aを $0.1\text{ mm} \leq A \leq 2\text{ mm}$ の範囲に設定し、かつ、凹部2の深さ寸法Hを $0.003\text{ mm} \leq H \leq 0.1\text{ mm}$ の範囲に設定し、さらに、隣り合う凹部2、2の間隔寸法Wを $0.02\text{ mm} \leq W \leq 2\text{ mm}$ の範囲に設定する。

【0018】上述した値に設定した理由としては、倒立四角錐台の底面の(正方形又は菱形の)一边の長さ寸法Aが、 $0.1\text{ mm}$ より小さい場合は、微細に過ぎ貼付け時に

かみ込む空気を排除するに不適であり、 $2\text{ mm}$ より大きい場合は、疎に過ぎ、やはり貼付け時にかみ込む空気を排除するに難が発生する。

【0019】また、凹部2の深さ寸法Hが、 $0.003\text{ mm}$ より小さい場合は、浅過ぎて貼付け際にかみ込む空気を排除できなくなり、 $0.1\text{ mm}$ より大きい場合は、深くなり、これを埋める為の粘着剤の量が過大となり、粘着シートの切断時に粘着剤がはみ出しを起こす等の不具合を生ずる。さらに、凹部2、2の間隔寸法Wが、 $0.02\text{ mm}$ より小さい場合は、形成される空気排除溝が狭くなり、空気を外方へ排除できない。 $2\text{ mm}$ より大きい場合は、凹部が疎となり所定の接着力が得られない。

【0020】ところで、帯状素材紙11は、繊維方向が長手方向Lに配置されている。即ち、紙又はプラスチックフィルムを製造する場合、材料を走行(長手)方向に各種加工を行ってゆくため、繊維が走行方向である長手方向に並ぶ。そのため、長手方向への強度が幅方向に比べて著しく大きい。

【0021】従って、この繊維を横切って直角に凸部を喰込ませることは大変困難な作業であるが、本発明では、上述のように $30^\circ \leq \theta \leq 60^\circ$ の傾斜をもって微小凹部2の各辺が配置されるので、比較的小さな押圧力にて凹状加工ができる。

【0022】なお、帯状素材紙11のシート基材4を紙とした場合、種々のものが使用可能であり、例えば坪量 $50\text{ g/m}^2 \sim 200\text{ g/m}^2$ 程度のト質紙を使用するも好ましい。そして、上述したように、紙の表面をポリエチレン等でラミネートする。そのラミネートの厚さは、 $10\mu\text{m} \sim 30\mu\text{m}$ とするのが好ましい。

【0023】また、ポリエステルフィルム等の硬質プラスチックを剥離フィルム(帯状素材紙11)に使うことが多いが、この場合も本発明の方法により比較的小さな押圧力にてU状加工ができる。なお、プラスチックの材質としては、ポリエチレン、ポリプロピレン、ポリエチル等が使用可能である。

【0024】次に、この剥離紙1の剥離処理面加工方法について述べる。図4は剥離処理面加工のための装置の全体簡略説明図である。図5は、それに用いられるエンボスロール8の拡大要部斜視図である。この図4と図5に示すように、周方向Mに対して $30^\circ \sim 60^\circ$ の傾斜角度θをもって傾いた四辺により形成される正方形又は菱形を底面とする独立した多数の四角錐台状の微小凹部7…を表す全周に配置した鉄型エンボスロール8を形成する。

【0025】例えば、エンボスロール8の直径を $300\text{ mm}$ とし、さらに、微小凹部7は、上面の一边の長さ寸法を $0.30\text{ mm}$ 、底面の一边の長さ寸法を $0.50\text{ mm}$ 、隣り合う凹部7、7の間隔寸法を $0.05\text{ mm}$ 及び高さ寸法を $0.065\text{ mm}$ であって、傾斜角度θを $45^\circ$ と設定する。

【0026】次に、上記エンボスロール8と対応させた

ペーパーロール（又はイムロール）9を設け、ロール面長1300mmのエンボスロール8の両端に所定の押圧力が加えられる。そして、縦山ロール12に巻かれた長尺の（図3の状態の）帯状素材紙11を矢印E方向に線出し、エンボスロール8に向かって素材紙11を矢印J方向に走行させる。

【0027】統いて、エンボスロール8、ペーパーロール9はそれぞれ矢印F、G方向に転動しており、両ロール8、9の間に帯状素材紙11が送りこまれて、上記凸部7…に対応した0~45°の凹部2…が、帯状素材紙11の剥離処理面Cの全面に形成される（図1と図2参照）。その後、剥離紙1は矢印K方向に走行して、巻取りロール13に矢印L方向に巻取られる。

【0028】例えば、図3の状態の帯状素材紙11のシート基材4を、坪量110g/m<sup>2</sup>の上質紙とした場合、繰出張力及び巻出し張力を各30kg、50m/minの走行速度の条件で形成すると、「しづわ」が発生することなく、深さ寸法IIが0.04mmの凹部2…が形成された。また、厚さ寸法Tを0.038mmとしたプラスチックフィルムに、同様の条件で凹部2…を形成すると、深さ寸法IIが0.020mmの凹部2…が形成された。

【0029】この剥離紙1は、図6（イ）に示すように、剥離処理面C側に、粘着剤が塗布され、一部は剥離紙1の微小凹部2…内に充填される。つまり、微小凹部19が形成される。その後、この粘着剤を乾燥させて粘着層14を形成する。次に、粘着層14の剥離紙1側とは反対面に表面シート本体15の一側面を密着させ、粘着層14と剥離紙1を相互に密着させて、粘着シート本体16とする。この粘着シート本体16は、剥離紙1のみを容易に剥離除去することができる。使用時には、剥離紙1を剥がして、表面シート本体15を他の物体に、粘着層14を介して、貼付けることができる。

【0030】なお、本発明は上述の実施の形態以外にも、設計変更自由である。例えば、微小凹部2…は、底面の一辺の長さ寸法A、深さ寸法H、及び隣り合う凹部2、2の間隔寸法Wは、0.1mm≤A≤2mm、0.003mm≤H≤0.1mm、及び0.02mm≤W≤2mmの範囲で変更自由である。また、図7に示した菱形とする以外に、平行四辺形やその他の四角形としてもよい。

### 【0031】

【発明の効果】本発明は上述の構成により、次のような著大な効果を有する。

【0032】（請求項1又は2によれば、）剥離紙1の長手方向に直角な方向と異なる向きをもつ邊により凹部2…が形成されるので、従来よりも小さい押圧力と張力で剥離処理面Cに凹部2…を形成することができる。かつ、表面に「歪み」が少なく、「しづわ」もない美しい剥離紙1を形成できるので、粘着加工がしやすく、美しい粘着シート本体16をつくることができる。

### 【0033】四角錐台の辺が長手方向に直角、平行であ

る従来の剥離紙に粘着加工した場合、粘着剤面に凸部が形成されるが、それによってまた形成される凹溝部の深さが直角、平行で異なり、粘着剤が塑性変形して谷部（凹溝部）が埋められる時、直角方向が早く埋まり均等とならない。この事はプラスチックに貼付け後に発生するガスを逃がす際に支障となるが、本発明によれば埋められる早さがいずれの方向へも均等になるので支障が減少する。

【0034】（請求項3又は4によれば、）凹状加工がしやすく、正確な凹部2…を形成できる。また、粘着層14と他の物体との間に空気を貼り込むことがなく、いわゆる「ふくれ」が生じない。しかも、粘着層14とそれを貼付けた他の物体の間に発生したガスを自然に抜くことができ、「ふくれ」が生じない。

【0035】（請求項5によれば、）エンボスロール8の表面に周方向Mに対して傾斜角度Bをもつて凹部7…が形成されているので、剥離紙1の機械力に向からずされた位置に凹部7…が押圧される。そのため、凹部7…が喰込みやすいので、剥離紙1に、「歪み」や「しづわ」を発生することがなく、正確な凹部2…を形成できる。しかも、速い操業速度で加工することができて、能率がよい。

【0036】また、粘着層14の表面の微小凸部19…間に形成された凹溝部（谷部）の深さが、いずれの方向にも均等化でき、貼付けた後に発生するガスを逃がす上で、好ましい。言い換えると、（粘着シート16として、）凹溝部（谷部）の方向性が無くなって、四方八方へガスが逃げてゆくことで、「ふくれ」を防止できる。

### 【図面の簡単な説明】

【図1】本発明の実施の一形態を示す要部拡大平面図である。

【図2】図1のB-B拡大断面側面図である。

【図3】加工前の状態を示す拡大面側面図である。

【図4】加工方法を示す簡略説明図である。

【図5】要部を拡大した斜視図である。

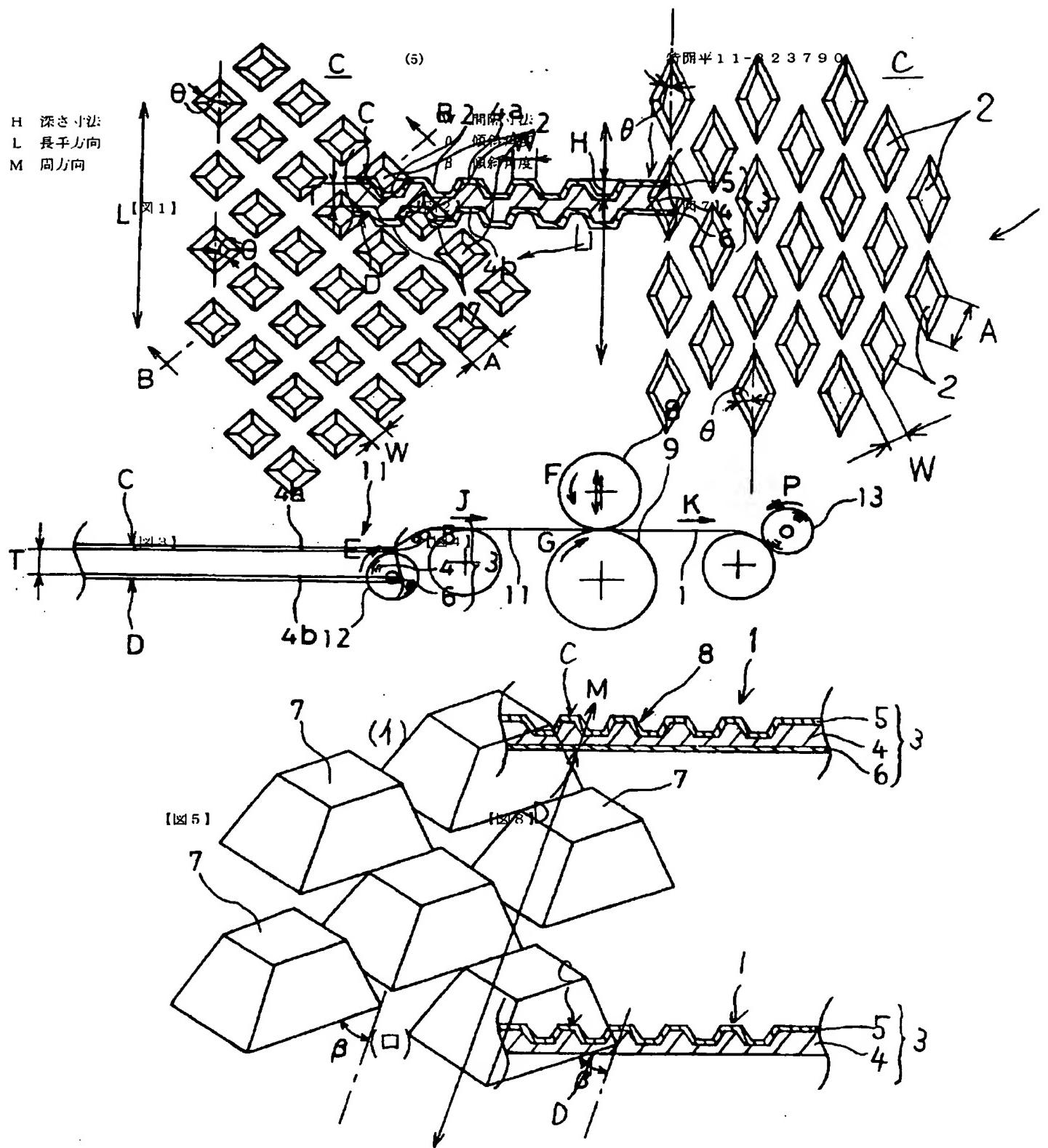
【図6】粘着シートとしての各種の実施の形態を示す拡大面側面図である。

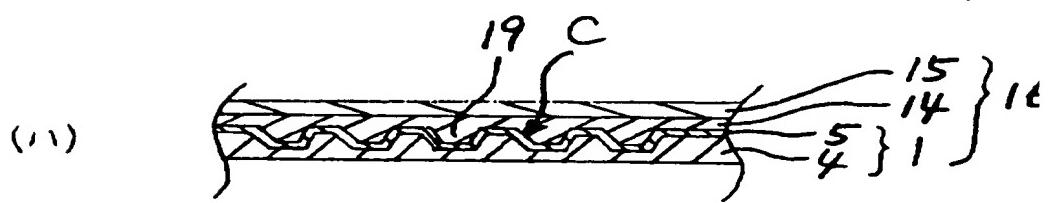
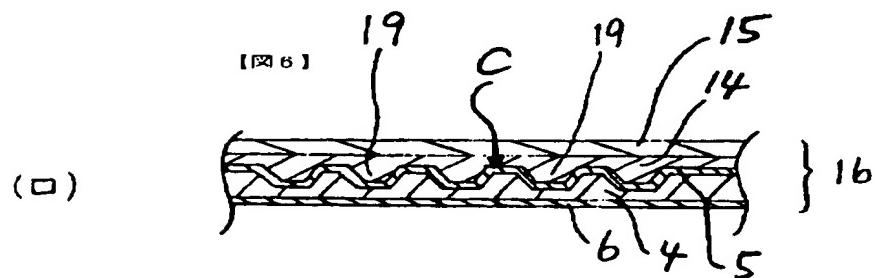
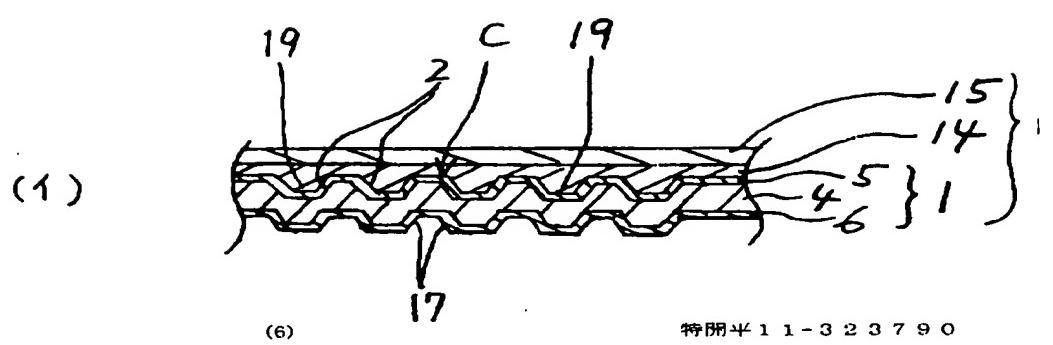
【図7】図1に代わる変形例の要部拡大平面図である。

【図8】図2に代わる変形例を示す拡大断面図である。

### 【符号の説明】

- 2 微小凹部
- 7 微小凸部
- 8 エンボスロール
- 11 帯状素材紙
- 14 粘着層
- 15 表面シート
- 16 粘着シート
- 19 微小凸部
- A 長さ寸法
- C 剥離処理面





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